

# Rationale for a maths activity using 3d shapes



In the first year of QTS, for my placement I was allocated a place in a multi-cultural school, in a year 5 class. Having been in this class for a few months, I was now familiar with the class routines, the teaching staff and the children. I was also aware that at the end of the year the children will be taking their mini or otherwise known as their practice SATS. The children were knowledgably secure in all subjects, but I did notice that there are some children within this class who still find it difficult to understand the concepts of different shapes, for example the idea associated with 3-D shapes was more difficult for children to experience and understand than 2-D shapes as they are properties of a shape having a third dimension. (Frobisher et al. 2007, p. 109).

According to Pierre and Dina van Hiele-geldof cited in Haylock (2006, p. 290)

‘ Children can name and recognise shapes, by their appearance, but cannot specially identify properties of shapes or use characteristic of shape for recognition and sorting’

Taking this into consideration, I tried to think of something that could be used to increase the children’s knowledge and awareness, but at the same time also be a lesson that the children will enjoy and remember in the future.

I wanted to help the children to do well in their SATs and also understand the different names of the 3-D shapes and their properties. In mathematics the level descriptor for attainment target 3; Shape, space and measure also state that pupils should be able to:

‘ Use mathematical names for common 3d shapes and describe their properties, including number of sides (DFEE 2000 p. 13).

To help me plan a suitable activity, I started to read around the subject of children’s understanding of mathematical concepts, especially shapes.

Three of the most influential theorists of children’s mathematical thinking and learning are Vygotsky, Bruner and Piaget. Vygotsky work can assist us in our understanding of some of the ways in which children process their understanding of mathematical thinking in everyday situations and later on in life. He states that children learn in different stages, firstly they start to learn by using loose criteria such as colour or sound, then the child moves on to use more scientific mathematical concepts such as the number of sides a shape has. Vygotsky’s work suggests that children learn movement of understanding by being given the opportunity to experience and make sense of something. This suggests that learning is not always predictable (Eysenck, M. 2000, pp. 409-426).

Vygotsky’s work also emphasised the importance of group work and the influence the child’s social environment can have on their learning. An important contribution his work can make in the field of maths is his support for the idea of group work, something which is not seen as much in any other subject besides maths. Vygotsky said:

‘ What a child can do in co-operation today, he will be able to do alone tomorrow’. (Eysenck, M. 2000, pp 409 -426).

According to another learning theorist Bruner, children are born with a 'Tabula Rasa', which is a blank slate but with the aid of education their slate begins to fill up with new found knowledge. Bruner further developed the idea of Vygotsky in the educational context. The concept of scaffolding effected Bruner's thinking, he believed that language, interpersonal communication, as well as the involvement of an experienced adult or peer assists in the child's way of thinking. He strongly believed that language played an important part in the child's learning, because language provides a frame work within which the child learns to understand and then makes a meaning of the learned concept.(Smith et al 2003, pp. 376-377)

According to the psychologist Jean Piaget (1896-1980) cited in Smith et al (2003):

' Children's intellectual levels develop over a child's life. He states that there are four stages towards developing cognitively' (p. 393).

All three psychologists believe that children are effective on their own learning. Piaget believed that children learn according to when they are freely allowed to explore the activities that take place, whereas Vygotsky believed that learning took place if they were instructed to do something with the helping hand of the teacher or another experienced adult. (Smith et al. 2003, p. 495)

Taking in to account all the different ideas of all three theorist, I believe that children need instructions in order for teaching to take place other wise children's knowledge would be very minimal and no progression would occur to enhance their learning and development. Children need a focus in their

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structured lesson, and with the help of more knowledgeable others, the learning will be able to take place effectively. I also believe that children learn in stages but with the appropriate teaching and guidance these stages can develop at the right pace and age.

The planned activity involved using all the strategies mentioned above. (See activity planning)

These ideas are supported by the 'activity theory' which is developed by Bruner, Vygotsky (Mason p. 7). This theory of learning is that learning is an ongoing process that is influenced by teaching. Vygotsky highlights that children have a gap in their ability, that gap can begin to fill only by the help of more knowledgeable others. Whereas, Piaget believes that children learn in stages, they cannot progress to the next stage of cognitive development no matter how much teaching has been implemented.

Having to plan and teach certain subjects in our school serial visits, our views and opinions change, which will ultimately effect what we first believed and thought. This can be implemented within school teaching, therefore, the idea of Wragg (1993) needs to be taken aboard when planning that;

'Planning for progression requires vision of where we are going' (p. 29).

For this activity I chose 6 children, 2 from each ability group. The reason for this type of grouping, being that the children in the higher ability would be able to help those in the less able group

The planned activity took place in a quiet place, just outside the main class. The activity started with a discussion in which children were encouraged to inform me of their previous experience of shapes. I then took the children outside and asked them to name any 3-D shapes that they can see.

Once inside, I had a bag that contained different shapes I described the shape (see planning) and asked the children to tell me the name of the shape. The children were allowed to confer with each other. Piaget as discussed in Nichollis (1999) observed that children learn faster when they co-operate with others; this co-operation develops and improves their formal thinking. (p. 41)

The activity was fun was the comment the children made when they finished. Looking back I can see that the 4 children in the top end of the ability groups found this activity considerably easy, whereas the other 2 children were struggling. These 2 children kept using the 2-D shape names, such as square, circle to answer my questions. According to Montague-Smith (2002):

Children will not be able to differentiate between 2D and 3D shapes, rather they will draw 2D representations, such as an enclosure for a square, circle or rectangle and for a cube, sphere, and so on(p. 109).

I also noticed that some of the children were struggling to understand the language (such as ' faces') I was using to describe the different shapes in the bag. Montague-smith (2002) stresses that:

' Sometimes children hear 3D shapes named by a face, such as a brick as a ' square' or a cylinder as a ' circle,' which is confusing for the child and should be avoided (p. 105).

To counter this problem I would have to re-plan this lesson and perhaps start with using simpler vocabulary for the lower ability and then build upon that. For the higher ability, I would get the children to write down statements describing certain 3-D shapes, for example ' this shape has four faces...' in the plenary I would ask these children to ask their questions o the rest of the class, thus creating an enjoyable activity, where everyone is actively involved. Claxton (1997) cited in Pound (1999) underlines the importance of taking time to create playful links, not just in early childhood but throughout life (p. 29).

Even after careful planning of the activity, I found that I did not have enough time in the delivery of the activity, therefore I myself delivering the activity at a fast pace and using language children found difficult to understand. I also understand that maths is the area that I struggle most in and must work on in the future. It is important that I carry out a lot of research in the area that I am to teach. I must also pre plan any questions the children are likely to ask if am not to loose their interest in the lesson.

If I had the opportunity I would plan a whole class lesson on 3D shapes, firstly because I would have more time and secondly there are other children in this class who are not confident in using the different names associated with 3-D shapes. This maths activity was an enjoyable experience for me as well as the children. To extend this lesson, I would perhaps link it cross-

curricula to art, where the children will have the opportunity to go out and take photos of different 3-D shapes that they see and then make a collage using a variety of different materials to make the 3D shapes that stand out and are appealing to the eye.